Type in U. S. National Herbarium, nos 1791403–404, collected on Antelope Ridge, Stann Creek Valley, British Honduras, February 5, 1940, by Percy H. Gentle (no. 3197). It consists of a nearly complete frond (lacking only the extreme tip), attached to the apical portion of the caudex. Additional material of this collection is in the Herbarium of the University of Michigan and the National Herbarium.

Alsophila ursina is notable for the very dense persistent covering of long, spreading or retrorse, bright brown scales of its stipe and rachis. These give it a remarkable shaggy appearance, which has suggested the specific name.

ZOOLOGY.—*Rhizocephalan parasites of hermit crabs from the Northwest Pacific.*[1]

EDWARD G. REINHARD, Catholic University of America.

Only two rhizocephalan parasites of hermit crabs have previously been reported from the Northwest Pacific: *Peltogasterella socialis* Krüger from Puget Sound (Potts, 1915) and *Peltogaster* sp. from Nanaimo, British Columbia (Boschma, 1931). The material discussed in the present paper includes five genera and eight species, of which one genus and four species are new. This is not surprising in view of the limited attention the Rhizocephala have received in North America and the absence of any studies on these animals from Alaskan waters, where many specimens of the present collection were gathered years ago by the United States Fish Commission steamer *Albatross*.

A small but interesting lot of Rhizocephala from Puget Sound received from Dr. Roland Walker of Troy, N. Y., in 1940 provided the nucleus for the present study. This collection was especially noteworthy because on one species of crab, *Orthopagurus schmitti* (Stevens), there were three different rhizocephalans, two of which were new species. A personal search by the author of the general collection of Paguridae in the United States National Museum brought to light many additional parasitized hermit crabs, hitherto unstudied, and a few others were obtained from the Museum of History, Science and Art, Los Angeles, Calif.

Grateful acknowledgments are due Dr. Waldo L. Schmitt and his associate Clarence R. Shoemaker for many courtesies and ever-ready help extended the author during his visits to the division of marine invertebrates of the United States National Museum. To my former student, Sr. Mary Andrew Rauwolf, thanks are also extended for laboratory assistance in studying some of the Puget Sound material.

[1] Received December 20, 1943.

Family PELTOGASTERIDAE Lilljeborg

Genus **Peltogaster** Rathke

Peltogaster paguri Rathke

Material examined.—Coal Harbor, Unga Island, Alaska Peninsula, 8–9 fathoms, 1872, six specimens on six *Pagurus capillatus* (Benedict), W. H. Dall coll. U.S.N.M. 80471.

Unalaska, Aleutian Islands, tidal zone, July 10, 1937, two specimens on one *Pagurus hirsutiusculus* (Dana), V. B. Scheffer coll. U.S.N.M. 145827.

There is only one previous record of *Peltogaster paguri* from the Pacific Ocean, that of Krüger (1912), who mentioned this parasite as occurring on *Pagurus gracilipes* (Stimpson) from Japan. One specimen from each of the above hosts has been sectioned, and they exhibit no peculiarities when compared with specimens from the North Atlantic. This species probably parasitizes a number of other hermit crabs in the Alaska region. A peltogaster on *Pagurus trigonocheirus* (Stimpson) (U.S. N.M. 80472) and another on *Pagurus cornutus* (Benedict) (U.S.N.M. 80481), both from the Bering Sea, appear to be this species, but these specimens are too poorly preserved to permit certain identification and were not sectioned.

For anatomical details and literature on *Peltogaster paguri* see Boschma (1928, 1933); for life history and host-parasite relationship see Reinhard (1942, 1942a, 1942b).

Peltogaster boschmae, n. sp.

Fig. 3

Cotypes.—San Juan Archipelago, Wash., north shore of Stuart Island, 45 fathoms; off

False Bay, San Juan Island, 10–20 fathoms; south of Skipjack Island, 32 fathoms; August, 1940, three specimens on three *Orthopagurus schmitti* (Stevens), Roland Walker and Melville Hatch coll.

The host crabs in all three cases were females of about 4 mm carapace length and carried the parasite on the left side of the abdomen between the first and second pleopod. The specimens were oriented with their long axis parallel to the long axis of the host and with the mantle aperture directed forward. All three have been sectioned.

Diagnosis.—Body small, plump, curved. Stalk in the center of the dorsal surface, with elongated shield. Colleteric glands simple, at level of stalk. Male organs coextensive with shield; testes straight, bordered by distinct basement membrane, vasa deferentia coiled near their terminations. Ganglion overlapped by anterior ends of testes.

Description.—The dimensions of the largest specimen are: length 3.8 mm, breadth 1.5 mm, thickness 1.7 mm. Another specimen, slightly smaller, measures in length 3.3 mm, in breadth 1.5 mm and in thickness 1.5 mm. The third was damaged but its size must have been almost identical with the latter. Despite their small size, all three are mature animals with embryos present in the mantle cavity.

The slightly elevated mantle aperture lies at the anterior end of the animal but appears to be anterolateral because of the curvature of the sac. A prominent, slightly sinuous shield, resembling that found in *Peltogaster paguri*, attaches the central stalk to the dorsal surface of the animal. At its insertion into the body wall of the host the stalk lacks the projections of chitin which radiate from the holdfast of *P. paguri*.

The smooth external cuticle is 5μ to 9μ thick. Well developed muscles, including those of the sphincter, characterize the mantle, which is variable in thickness. It is thicker dorsally than ventrally and presents a number of low elevations on its inner surface. Although the nature of the retinacula was not ascertained, indications of their presence were occasionally seen on the internal cuticle examined in sections.

The mesentery is nearly as broad as the visceral mass and together they give a somewhat columnar appearance in transverse section. They extend the entire length of the sac. All the organs, except the ovaries, are confined to the midregion demarcated by the dorsal shield.

In "reading" the serial sections, the anterior ends of the testes are encountered before the ganglion comes into view. This organ in transverse section is shaped somewhat like an ox-yoke and rests ventrally against the front tips of the testes. In *Peltogaster paguri* the ganglion is located anterior to the blind ends of the testes.

The male genital organs are comparatively thin-walled straight tubes and the hypertrophied region (honeycomb wall) is not so pronounced as in *P. paguri*. The outer surface of each testis is composed of a rather thick structureless membrane which is enveloped exteriorly by a thin layer of connective tissue cells. The presence of this membrane may be taken as a specific feature, since nothing like it occurs in the testes of *P. paguri*. At their posterior ends, the testes gradually pass into the vasa deferentia which are fairly long and become coiled near their terminations on the lateral surfaces of the visceral mass.

The colleteric glands begin in front of the stalk and end at the level of the stalk. They therefore occur in sections with the anterior portions of the testes. In one of the smaller specimens they are broadly crescentic in cross-sectional appearance but in the largest specimen they are more irregular. The epithelial wall of the gland is well developed.

There can be no doubt that this is the parasite studied and figured by Boschma (1931) under the name *Peltogaster* sp. in his account of the Rhizocephala of Dr. Th. Mortensen's Pacific Expedition, 1914–16. His material consisted of four specimens found on small unidentified pagurids collected at Nanaimo, British Columbia. The largest specimen had a length of 4 mm. As far as Boschma's description goes, it agrees in every detail with the animals described above. He noted the well-developed shield, the central stalk, the position and general characteristics of colleteric glands, testes, and vasa deferentia, but failed to observe the ganglion and the histology of the testes, the two main points, which, together with size, distinguish this species from *P. paguri*.

"Differences in size," remarks Boschma, "do not furnish sufficient evidence for regarding the

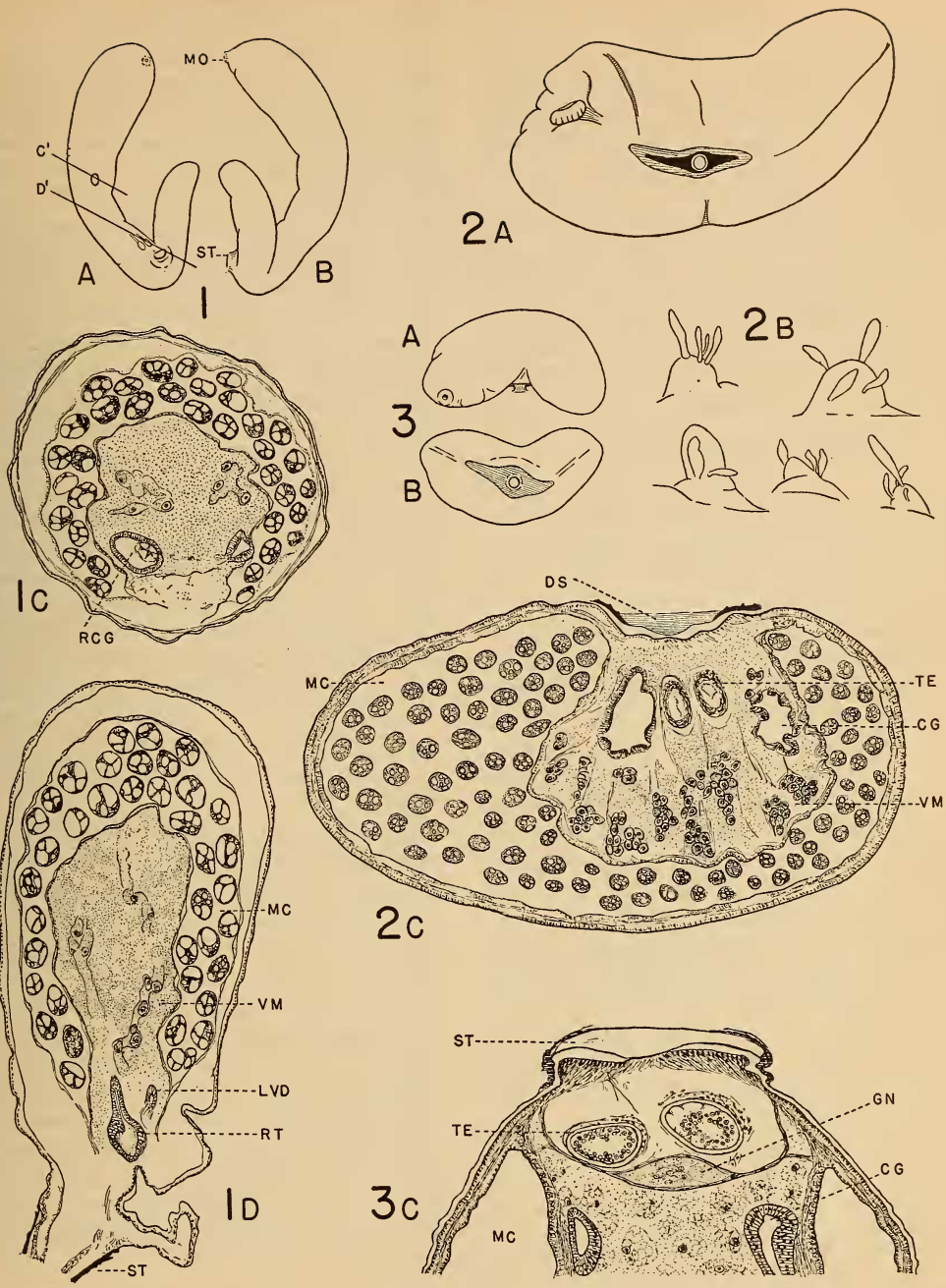

Fig. 1.—*Angulosaccus tenuis*, n. gen. and sp., from *Parapagurus armatus* Benedict, off Washington. *A*, Dorsal aspect of external sac viewed in tetralin, ×3. Lines *C'* and *D'* indicate planes of sections *C* and *D*, respectively. *B*, Right lateral aspect of same external sac, ×3. *C*, Transverse section through region of colleteric glands, ×25. *D*, Section passing through testes and stalk, ×25.

Fig. 2.—*Peltogaster depressus*, n. sp. *A*, From *Pagurus capillatus* (Benedict), Kodiak Island, Alaska, dorsal surface, ×5. *B*, Various retinacula from internal cuticle, ×300. *C*, Transverse section through anterior portion of dorsal shield, ×18.

Fig. 3.—*Peltogaster boschmae*, n. sp. *A*, From *Orthopagurus schmitti* (Stevens), San Juan Archipelago, Washington, lateral view, ×7. *B*, The same, dorsal surface, with anterior end directed towards the left, ×7. *C*, Portion of transverse section at anterior edge of stalk, ×67.

CG, colleteric gland; *DS*, dorsal shield; *GN*, ganglion; *LVD*, left vas deferens; *MC*, mantle cavity; *MO*, mantle opening; *RCG*, right colleteric gland; *RT*, right testis; *ST*, stalk; *VM*, visceral mass.

specimens from Nanaimo as representatives of a species which differs from *Peltogaster paguri*. But on the other hand I do not feel justified to identify them as *P. paguri*. For the present it is better to wait till more material from the locality has been examined."

The San Juan Archipelago, from which my specimens were obtained, is sufficiently close to the Nanaimo region to be considered the same general locality and accordingly I identify the Nanaimo specimens with the species described here and name the animal *P. boschmae* in honor of Dr. Boschma.

Peltogaster depressus, n. sp.

Fig. 2

Type.—Off Karluk, Kodiak Island, Alaska, 31 fathoms, July 19, 1897; one specimen on *Pagurus capillatus* (Benedict), *Albatross* coll. U.S.N.M. 80476.

Additional specimen.—Bering Sea, 57° 43′ 00″ N., 164° 42′ 00″ W., 31 fathoms, July 29, 1893; one specimen on *Pagurus capillatus* (Benedict), *Albatross* coll.

The hosts in both instances are males of 15–16 mm carapace length, and the parasites were attached to the abdomen, ventrolateral to the first pleopod, with their longitudinal axis parallel to that of the host. Both specimens have been sectioned, and the slides of the type are in the U. S. National Museum.

Diagnosis.—Sac flattened in dorsoventral direction, mantle opening on dorsal side near anterior margin, stalk central arising from fusiform dorsal shield. Testes straight, vasa deferentia coiled. Colleteric glands adjoining anterior portions of testes. Visceral mass fan-shaped in cross section. Retinacula consisting of two to five spindles on a prominent excrescence.

Description.—Compared with the other species of *Peltogaster*, this species is remarkably flat and broad. The type specimen has the following dimensions: 10.5 mm long, 5 mm wide, 3 mm thick. The measurements of the second are: 19 mm long, 10 mm wide, 5 mm thick.

The smaller parasite is practically straight, the larger one bent a little to the right. Both are flat dorsally and slightly arched ventrally. The mantle opening, at the anterior end, is peculiar in being shifted dorsally. It is a small aperture surrounded by a very low corrugated papilla. The stalk, approximately central in location, is comparatively narrow and arises from a fusiform dorsal shield. The insertion of the stalk in the body of the host is a heavily chitinized holdfast having branched marginal projections.

In both specimens the mantle cavity is spacious and contains numerous developing eggs. The visceral mass in cross section is rather fan-shaped, its mesenterial portion being much narrower than the broad distal portion which is flattened or slightly concave. It is well supplied with muscles: a circular layer at the periphery, and slender bundles at the interior, some of which run vertically, others transversely, and others diagonally.

In most other details of internal anatomy the animals resemble *Peltogaster paguri* very closely. The male genital organs and the colleteric glands are located under the dorsal shield, the glands being adjacent to the germinal or anterior portions of the testes. Coiled vasa deferentia pass backwards from the tubular testes as in *P. paguri* and end within the limits of the shield. The ganglion lies a short distance in front of the blind ends of the testes.

The retinacula that occur on the thin internal cuticle furnish further evidence that this is a distinct species. Each retinaculum (Fig. 2, B) is a rather tall and broad hillock, from the sides or summit of which arise two to five spindles, or rarely a single spindle. These have a more or less pointed extremity and a narrowed, stalklike basal part. They vary in thickness and length in the same cluster. Usually there is one large spindle 20μ to 24μ in length in each group along with others of lesser length. The smallest are 5μ to 6μ long. In *Peltogaster paguri* the spindles are fairly uniform in size, about 16μ long, are often single, and arise from the summit of a much less prominent excrescence.

Genus Peltogasterella Krüger

Because of the new species described below the diagnosis of this genus (Boschma 1933) is here amended:

Gregarious, external sacs elongate, more or less cylindrical. Mantle opening at the anterior extremity, stalk at or near the posterior extremity. Mesentery broad (as in *Peltogaster*). Testes enclosed in a common sac, dorsally

situated in the posterior third of the animal. Vasa deferentia short, opening backwards into the mantle cavity. Colleteric glands near middle of body at lateral surfaces of the visceral mass, consisting of simple flattened cavities. Nauplius larvae, on Paguridea.

Two species known.

Peltogasterella socialis Krüger

Fig. 5

Material examined.—Yaquina Light, Oregon-Washington coast, 34 fathoms, September 2, 1914; 7 specimens of 3–4 mm length on one *Pagurus alaskensis* (Benedict), *Albatross* coll. U.S.N.M. 80461.

Straits of Juan de Fuca, Wash., 53 fathoms, September 2, 1891; 10 specimens of 8 mm length on one *Pagurus aleuticus* (Benedict), *Albatross* coll. U.S.N.M. 80462.

Kasaan Bay, Prince of Wales Island, southeastern Alaska, 42–47 fathoms, July 1903; 3 specimens of 7–8 mm length on one *Pagurus aleuticus* (Benedict), *Albatross* coll. U.S.N.M. 80466.

Northwest of Unimak Island, Alaska, 41 fathoms, June 24, 1890; 52 specimens of 5–9 mm length on *Pagurus splendescens* Owen (40 on one host, 12 on another), *Albatross* coll. U.S.N.M. 80467.

Alaska, Bering Sea, 56° 12′ 30″ N., 162° 13′ 00″ W., 47 fathoms, June 28, 1890; 6 specimens of 3 mm length on one *Pagurus splendescens* Owen, *Albatross* coll. U.S.N.M. 80468.

In external form the specimens conform to the descriptions and drawings of previous authors (Krüger, 1912; Potts, 1915; Boschma, 1933; Hiro, 1935). Boschma is the only one who has given details of the internal anatomy, and to his description a number of new points are here added.

Diagnosis.—Body slender, cylindrical, concave dorsally; length at least three times the breadth; broadest near anterior pole. Stalk thin, feebly chitinized, arising dorsally from posterior pole. Testes in posterior third of body, enclosed in common sac; vasa deferentia short and straight, opening posteriorly. Colleteric glands simple, placed slightly posterior

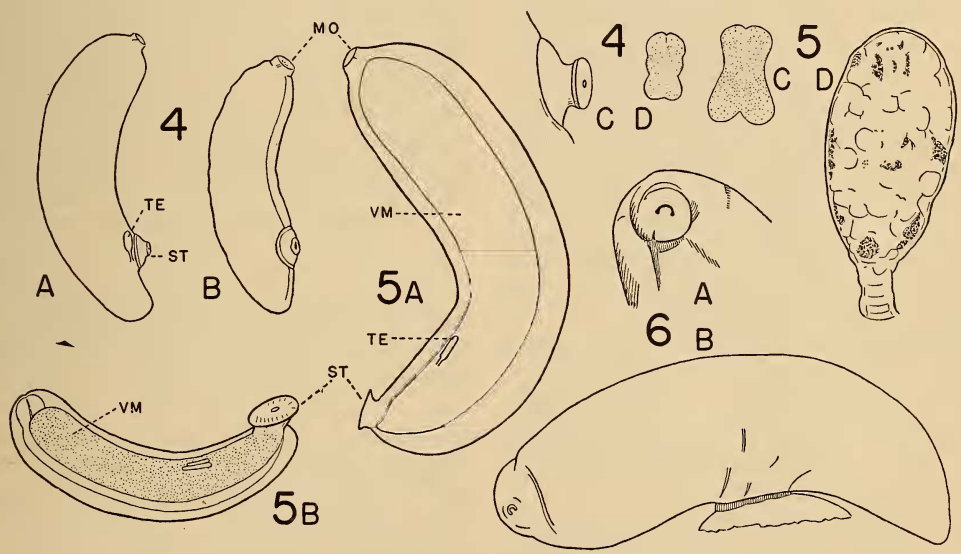

Fig. 4.—*Peltogasterella subterminalis*, n. sp. *A*, From *Pagurus hemphilli* (Benedict), San Miguel Island, Calif., lateral view of cleared specimen, ×8. *B*, From *Orthopagurus schmitti* (Stevens), San Juan Island, Wash., lateral view, ×8. *C*, Stalk of specimen from *P. hemphilli*, ×17. *D*, Eye of nauplius larva, ×400.

Fig. 5.—*Peltogasterella socialis* Krüger. *A*, From *Pagurus aleuticus* (Benedict), Straits of Juan de Fuca, Wash., lateral view of cleared specimen, ×8. *B*, From *Pagurus splendescens* Owen, Alaska; immature animal with undeveloped mantle opening (at left); dorsolateral view of cleared specimen, ×13. *C*, Eye of nauplius larva, ×400. *D*, Saccular type of testis; entire organ dissected from parasite, ×180. Note pigment spots in testis.

Fig. 6.—*Clistosaccus paguri* Lilljeborg. *A*, Mantle aperture and adjacent area, ×7. *B*, Specimen from *Pagurus capillatus* (Benedict), Bering Sea, lateral view, ×5.

MO, mantle opening; *ST*, stalk; *TE*, testis; *VM*, visceral mass.

to middle of body. Ganglion at extreme anterior end of visceral mass. External cuticle smooth, thin; internal cuticle without retinacula.

Description.—The specimens examined can be divided into two forms, those having tubular testes and those with saccular testes. The tubular type was found in the parasites on *P. alaskensis* and in those on *P. splendescens* from Alaska, Bering Sea. All other specimens had saccular testes (Fig. 5, D). Unfortunately, the parasites with tubular testes were all very young animals, so a possibility exists that this may be a juvenile feature.

However, the specimens that Boschma examined, also parasites of *P. alaskensis* from the same general locality as ours, were mature animals of 6 to 8 mm length, and these evidently possessed tubular testes since he states that the testes and vasa deferentia formed a more or less straight tube and that the testes gradually passed into the vasa deferentia.

It is relatively easy to see the gross appearance of the testes of *Peltogasterella*, previous to sectioning, by examining the animal in a clearing oil which renders it transparent. We used tetralin (tetrahydronaphthalene) for this purpose. Viewed in this way, the tubular testes of a 4-mm animal were found to measure 360μ in length and 108μ in width for the left testis and 328μ in length and 99μ in width for the right testis. Measurements of saccular testes from 6-to-7 mm animals gave lengths varying from 167μ to 184μ and an average width of 85μ. In the case of the saccular testes the vasa deferentia emerge quite abruptly.

Since in all other structural details these two forms of *Peltogasterella* seem identical, I do not think it necessary to separate them into different species, particularly since we cannot be sure which form of testes Krüger's type specimens possessed.

Regardless of whether the testes are tubular or saccular, they are always enclosed in a common sac, a feature that Boschma fails to mention but that evidently existed in his specimens as evidenced by his figure 6. This sac is filled with a mesenchymatous tissue in which the gonads are embedded. The testes proper are comparatively thin-walled with a distinct basement membrane. In the majority of cases they contain brownish pigment spots.

The vasa deferentia, which are included in the sac only at their point of origin, diverge to open on the lateral surfaces of the mesentery. They are relatively thin, short and uncoiled.

The colleteric glands, seen in cross sections as comparatively tall, narrow sacs with a simple unfolded lumen, extend in mature animals about 300μ in a dorsoventral direction along the lateral surfaces of the visceral mass in a locus slightly posterior to the center of the body. At the very beginning of the visceral mass, a small ganglion is located.

The mantle is uneven in thickness, varying from 20μ to 60μ in the same cross section. Its musculature is feebly developed. The external cuticle of mature specimens measures 5μ to 8μ in thickness. On the thinner internal cuticle no retinacula were found.

Since the visceral mass in a 6-mm specimen is solidly packed with large eggs, and early embryos are likewise present in the mantle cavity, it is likely that more than one brood of nauplii is produced. The much shrunken visceral mass, practically devoid of eggs, occurring in an 8-mm specimen which has practically mature nauplii in the mantle cavity is interpreted as a sign of old age. Fifteen nauplii from this specimen were measured. They varied in length from 207μ to 247μ with an average of 230μ. The pigmented eye of the nauplius is relatively large, 32μ to 36μ long, and has a characteristic shape (Fig. 5, C).

Peltogasterella subterminalis, n. sp.

Fig. 4

Cotypes.—Off San Juan Island, Wash., 20–30 fathoms, August 5, 1940; 10 specimens, of 4 to 5 mm length on two *Orthopagurus schmitti* (Stevens), Roland Walker and Melville Hatch coll.

Additional specimens.—Cuylers Harbor, San Miguel Island, Calif., July 1939; 35 specimens of 5 to 6.5 mm length on six *Pagurus hemphilli* (Benedict), Museum of History, Science and Art, Los Angeles, Calif. U.S.N.M. 80464.

Stephens Passage, Alaska, 198 fathoms, July 14, 1903; 4 specimens of 5 mm length on one *Pagurus aleuticus* (Benedict), *Albatross* coll. U.S.N.M. 80463.

Afognak Bay, Afognak Island, Alaska, 19 fathoms, August 3, 1903; 15 specimens of 3 to 5 mm length on one *Pagurus dalli* (Benedict), *Albatross* coll. U.S.N.M. 80459.

Alaska Peninsula, 54° 55′ 00″ N., 159° 52′

00″ W., 35 fathoms, August 4, 1888; 12 specimens of 3 mm length on one *Pagurus splendescens* Owen, *Albatross* coll. U.S.N.M. 80480.

The specimens on *Orthopagurus schmitti* from the Friday Harbor region (San Juan Island) have been selected as the cotypes. Four of these were sectioned and two macerated in an effort to discover retinacula. The remainder have been deposited in the collections of the United States National Museum. One specimen from each of the other hosts was likewise sectioned, and some others were examined either cleared or as stained whole mounts.

Diagnosis.—External form slender, cylindrical; mantle opening at anterior extremity, tilted dorsally; stalk near posterior extremity but not terminal, arising from a thin conical shield. External cuticle thin, smooth; internal cuticle without retinacula. Male genital glands saccular, pigmented, in front of stalk; vasa deferentia short, straight, opening posteriorly. Colleteric glands simple, in anterior half of body. Ganglion at anterior end of visceral mass.

Description.—These parasites differ externally from *P. socialis* in being smaller and more uniform in diameter with a stalk that arises from a slightly elevated conical shield near the posterior end but never terminal in position (hence the specific name *subterminalis*). Internally, the chief difference lies in the position of the colleteric glands which are farther forward than in *P. socialis*. Moreover, this species appears to average fewer specimens per host than is the case with its congener *socialis*.

The largest specimen encountered measured 6.5 mm in length. The average length of 21 adult individuals was 5.2 mm. Width and thickness are approximately equal, varying from 1.2 to 1.7 mm in adult specimens.

The mantle, which measures from 20μ to 50μ in thickness, has rather numerous lacunae and well-developed bands of circular muscle. Longitudinal muscle fibers are practically restricted to the ventral side of the animal where they interrupt the circular layer. The external cuticle is 4μ to 8μ thick.

The visceral mass appears rounded in cross sections of immature animals, but becomes laterally compressed when embryos are present in the mantle cavity. On the lateral edges of the visceral mass are to be found the paired colleteric glands, the left gland being slightly anterior to the right. Their position is a little less than half the distance from anterior to posterior ends of the animal. The dorsoventral height of these glands, measured at the highest portion, is 200μ to 225μ; the lateral width about 90μ to 140μ.

The testes lie in front of the stalk, often so close that the shield covers them. As is the case with the colleteric glands, the left testis begins a little anterior to the right, and is often larger. The testes have a length of 215μ to 250μ and a maximum width of 110μ to 130μ. As in *P. socialis* both are enclosed in a single sac and have a well-defined basement membrane. The vasa deferentia are likewise similar to those of *P. socialis*.

A ganglion is present at the anterior extremity of the visceral mass and a sheet of what may be nervous tissue is sometimes seen as a thin transverse band between the ovaries and male genital organs.

The nauplii of this species differ from those of *P. socialis* in their smaller size and in the size and shape of the pigmented eye (Fig. 4, D). Twelve measured specimens averaged 202μ in length (max. 216μ, min. 190μ) and 135μ in width (max. 148μ, min. 126μ). The eye measures 22μ to 27μ in length as compared with 32μ to 36μ for *socialis*.

There is a small gregarious European peltogastrid, *Gemmosaccus sulcatus*[2] (Lilljeborg), which presents some points of resemblance to this new species of *Peltogasterella*. In both, the stalk is posterior and the testes are saccular and pigmented. But in *Gemmosaccus* the stalk is located at a distance of about two-thirds from the anterior end, while here the distance is greater, being about five-sixths of the total length. Moreover, the finer points of the internal anatomy of *subterminalis* such as the conspicuous testicular sac, and the character of the nauplius larvae likewise, definitely place it in the genus *Peltogasterella*.

This general resemblance of our species to *Gemmosaccus sulcatus* suggests that Krüger's report of finding the latter species on the coast of Japan may be erroneous. Krüger's (1912) account is brief and unsatisfactory, and it may be that the parasites he called *Peltogaster sulcatus* were actually *Peltogasterella* of the species described here.

[2] This species also occurs in the literature under the names *Peltogaster sulcatus* or *Chlorogaster sulcatus*.

Angulosaccus, n. gen.

Diagnosis.—Gregarious, body elongate, posterior portion reflexed laterally. Mantle opening at anterior extremity, stalk dorsal at the angle between anterior and posterior arms. Mesentery and visceral mass broad. Ganglion near anterior end. Colleteric glands simple. Testes saccular, paired, situated in front of stalk, with vasa deferentia emerging anteriorly. On Paguridea.

Genotype.—*Angulosaccus tenuis*, n. sp.

In all respects, except one, *Angulosaccus* conforms to the structural characteristics of the Peltogasteridae. The forwardly directed vasa deferentia, however, constitute a unique feature, certainly of generic significance, although not important enough in my opinion to justify setting up a new family. Inclusion of this new genus in the Peltogasteridae, necessitates, however, a redefinition of the family, since in all known genera of Peltogasteridae, except *Angulosaccus*, the testes open backwards into the mantle cavity. For the latest diagnosis of the family see van Baal (1937).

Angulosaccus tenuis, n. sp.

Figs. 1; 7, A

Cotypes.—Off Washington, 47° 22′ 00″ N., 125° 48′ 30″ W., 877 fathoms, June 29, 1889; 12 specimens on one *Parapagurus armatus* Benedict, *Albatross* coll. U.S.N.M. 80479.

Of the 12 specimens attached to the abdomen of the host, two were made into stained whole mounts, two were cut into serial sections, and one damaged specimen was used to study the nature of the cuticula.

Diagnosis.—Body slender, broadest near anterior end, posterior third reflexed dextrolaterally. Testes immediately in front of stalk, with straight vasa deferentia opening anteriorly. Colleteric glands about midway between stalk and mantle opening. No retinacula.

Description.—In external form the sacs are long, slender, and cylindrical, and are sharply bent at the region of the stalk so that the animal is somewhat V-shaped, but with the prepeduncular arm considerably longer than the postpeduncular. The anterior arm is curved in a dorsosinistral direction, and at its forward extremity a small inconspicuous mantle opening is present.

Eleven of the specimens are almost identical in size, measuring about 10 mm in length for the anterior arm and from 3 to 4 mm in length for the posterior arm. From a maximum width of 3 mm near the mantle opening, the sac tapers to a width of 1.5 mm within the first half of its length and thereafter remains relatively uniform to the posterior extremity, which decreases slightly to 1 mm in width. One specimen was very small, having a total length of 5.3 mm of which 3.8 mm represented the anterior arm.

The external cuticle is smooth and about 5μ thick. The internal cuticle lacks retinacula. Because the soft tissues of the mantle had, to a large extent, disintegrated, as is to be expected in specimens preserved for more than half a century, nothing further could be learned about the nature of the mantle.

The mesentery and visceral mass are broad and extend the whole length of the sac. In the entire region in front of the colleteric glands the visceral mass, in both sectioned specimens, has a rather broad midventral notch. Since preservation occurred shortly after the animals had released eggs into the mantle cavity, the visceral mass contained only a pair of thin irregular egg cords, which could be traced to their connections with the colleteric glands.

A small ganglion is located in the mesentery a short distance behind the mantle opening.

The colleteric glands, found on the dorsolateral sides of the visceral mass a little more than halfway between the mantle opening and the stalk, have a simple undivided lumen. They measure 225μ to 300μ in a dorsoventral direction, 100μ to 135μ laterally, and 325μ to 450μ in anteroposterior direction.

The two saccular testes lie dorsally, just in front of the stalk. They are comparatively small, measuring 250μ to 265μ in length and 170μ to 180μ in width. The thin vasa deferentia are not coiled and run forward a distance of 300μ to 450μ, being therefore longer than the testes. Each vas is lined with chitin throughout its length.

The stalk is fairly broad and arises from a disk-shaped plate. Both are chitinized, but not heavily so, the chitin measuring 20μ to 30μ in thickness.

The curious shape of this species is reminiscent of that of *Gemmosaccus delagei* described by Duboscq (1912) from the coast of

France, except that the latter species is bent in a ventral direction.

Family CLISTOSACCIDAE Boschma

Genus **Clistosaccus** Lilljeborg

Clistosaccus paguri Lilljeborg

Figs. 6; 7, B

This is the only known species of the genus *Clistosaccus*. It has been found on the following hermit crabs: *Pagurus bernhardus*, *Anapagurus chiroacanthus* and *A. forbesi*, and *Pagurus pubescens*. All previous records are from the North Atlantic region. I am now able to report its occurrence in the North Pacific and add several new hosts.

This animal is also referred to in the literature as *Apeltes paguri* Lilljeborg, but Boschma (1928) has shown that the two alleged species are different stages of one species only, *Clistosaccus* being the younger form, *Apeltes* the older mature form.

Material examined.—Bering Sea, 54° 48′ 00″ N., 165° 13′ 30″ W., 70 fathoms, June 24, 1890; five specimens on five *Pagurus capillatus* (Benedict), *Albatross* coll. U.S.N.M. 80474.

South of Alaska Peninsula, 54° 20′ 30″ N., 163° 37′ 00″ W., 61 fathoms, May 21, 1890, one specimen on one *Pagurus capillatus* (Benedict), *Albatross* coll. U.S.N.M. 80460.

South of Alaska Peninsula, 54° 05′ 30″ N., 162° 54′ 00″ W., 49 fathoms, May 21, 1890; three specimens on two *Pagurus dalli* (Benedict), *Albatross* coll. U.S.N.M. 80475.

Kodiak Island, Alaska, off Karluk Head, 122 fathoms, July 19, 1897; three specimens on one *Pagurus splendescens* Owen, *Albatross* coll. U.S.N.M. 80473.

The 12 specimens varied from 7 to 25 mm in length. The mantle opening when present has the appearance of an arched cleft on the summit of a short, smooth elevation. The arms of the opening enclose a pluglike extension of the visceral mass which projects to the exterior. Lilljeborg (1861) described the mantle opening of *Apeltes* (=*Clistosaccus*) as having an inferior border in the form of an obtuse point. If "dorsal" is substituted for "inferior" this description is essentially correct. All but two of the specimens had this type of opening; one, the smallest of 7 mm length, lacked a mantle opening; the other, of 10 mm length, had the beginning of a mantle opening, which had not yet perforated.

Boschma (1928) remarks that older specimens of *Clistosaccus* can not usually be distinguished from *Peltogaster paguri* without recourse to microscopic sections. There are, however, good external diagnostic features. The stalk of attachment in *Clistosaccus* is broad, in *P. paguri* it is much narrower; *Clistosaccus* completely lacks the thick chitinous dorsal shield (hence "*Apeltes*") which in *P. paguri* extends prominently anteriorly and posteriorly from the stalk and is the feature that suggested the name *Peltogaster*.[3] Moreover, at no stage in

[3] Rathke, who gave the name to the genus, was mistaken in considering the shield-bearing surface as the "gaster" or ventral side of the animal.

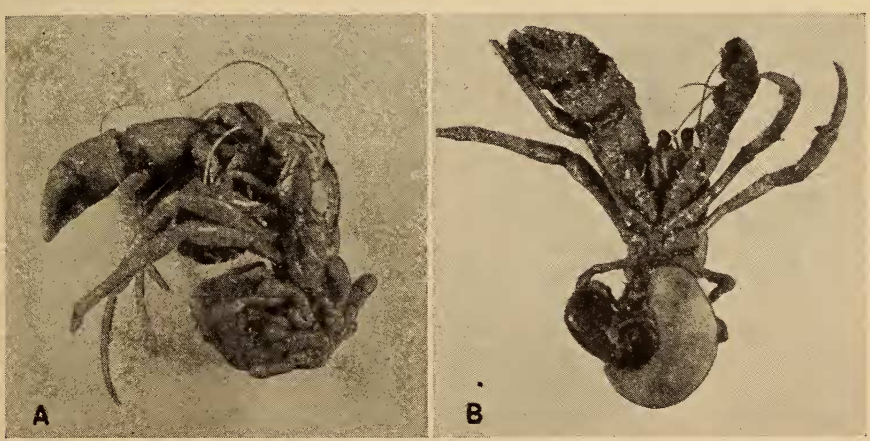

Fig. 7.—*A*, *Angulosaccus tenuis* n. gen. and sp., on *Parapagurus armatus* Benedict, Washington. *B*, *Clistosaccus paguri* Lilljeborg on *Pagurus capillatus* (Benedict), Alaska. Both natural size.

development does *Peltogaster* have a mantle opening like that described above for *Clistosaccus*.

Two specimens were sectioned and compared with material from the North Atlantic, but no essential difference could be detected between east and west coast animals. The single sac-like testis in the anterior region with its two short vasa deferentia and the lobulated colleteric gland at the posterior end of the visceral mass are as described by Boschma. Likewise, his statement that the internal cuticle lacks retinacula can be confirmed.

It may be mentioned that the visceral mass in normal specimens reaches only to the posterior margin of the stalk, which is located in the posterior half of the body, at variable relative distances from the middle. There is thus a fairly extensive post-peduncular region often present where internal organs are lacking.

Family Uncertain

Genus **Thompsonia** Kossmann

Thompsonia sp.

Material examined.—San Juan Archipelago, Wash., off False Bay, San Juan Island, 10–20 fathoms, Aug. 5, 1940; seven specimens on one *Orthopagurus schmitti* (Stevens), Roland Walker and Melville Hatch coll.

These parasites are small ovoid or pear-shaped sacs attached to the dorsal surface of the anterior abdominal segments of the host. The stalk of attachment is very short and has a proximal constriction. Stumps or scars of about 20 stalks are present on the abdomen in addition to the 7 stalked sacs still remaining. These sacs were mature since they contain cypris larvae.

The body of the parasite, exclusive of the stalk, measures 1.2 to 1.5 mm in length and 0.8 to 1.0 mm in thickness. The stalk is one-sixth or less the length of the body. The cypris larvae appear to lack pigmented eyes.

Boschma (1933) is of the opinion that in the present state of our knowledge it is impossible to decide which of the named forms of *Thompsonia* are distinct species. In accordance with this view I believe it best not to give a specific name to these specimens on *Orthopagurus*. The host, however, constitutes a new record for this genus. The parasites have been deposited in the collections of the United States National Museum.

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